PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of	)	Atty Dkt. No. UDL1P044C1
	)	
RONALDSON et al.	)	Examiner: UNKNOWN
	)	
Application No. HEREWITH	)	Art Unit: UNASSIGNED
	)	
Filed: HEREWITH	)	
	)	
For: MONITORING A SAMPLE CONTAINING A NEURTRON SOURCE	)	

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this paper and the documents and/or fees referred to as attached therein are being deposited with the United States Postal Service on February 13, 2002 in an envelope as "Express Mail Post Office to Addressee" service under 37 CFR §1.10, Mailing Label Number EL580401410US, addressed to the Commissioner for Patents, Washington, DC 20231.

Sandra Halliwell

PRELIMINARY AMENDMENT

Box Patent Application
Commissioner of Patents
Washington, DC 20231

Sir:

Please enter the following amendments prior to calculating the filing fee and examination of the above-identified application.

IN THE CLAIMS:

All pending claims have been reproduced below for the convenience of the Examiner. Claims which have been changed by this amendment are indicated with an asterisk ("*").

CLAIMS

1. A method of monitoring a sample containing a neutron source in which:

i) signals from a plurality of neutron detectors are analysed and the count rates for single, double and triple incidence of neutrons on the detectors are determined;

ii) the single, double and triple count rates are equated to a mathematical function related to the spontaneous fission rate, self-induced fission rate, detection efficiency and α,n rate;

iii) a probability distribution is assigned to each of the self-induced fission rate, detection efficiency and α,n reaction rate and each of the counting rates to provide a probability distribution factor for any given value;

iv) and the value of the product of all the probability distribution factors is increased to give an optimised solution and so provide a value for the spontaneous fission rate which is linked to the mass of the neutron source.

2. A method according to claim 1 in which the signals comprise a series of pulses, each pulse causing a time period to be considered, with other pulses being received in that period being associated with the initial pulse, the number of pulses in the sequence giving the single, double, triple and greater numbers of neutron counts.

*3. A method according to claim 1 wherein the singlet count rate is related to the spontaneous fission rate, the self-multiplication factor, where

$$m = \frac{1-p}{(1 - p)\upsilon_I}$$

and p = probability first neturon causes induced fission; the detection efficiency and the α,n reaction rate by the function,

$$R_1 = \epsilon . F_1 . M . v_{s1} . (1+\alpha)$$

* 4. A method according to claim 1 in which the doublet counting rate is related to the spontaneous fission rate, the self-multiplication factor, where

$$m = \frac{1-p}{(1 - p)\upsilon_I}$$

and p = probability first neutron causes induced fission; the detection efficiency and the α,n reaction rate by the function

$$R_2 = \varepsilon^2 \cdot F_S \cdot M^2 \cdot \nu_{S2} \cdot \left(1 + (M-1)(1+\alpha)\frac{\nu_{S1}\nu_{I2}}{\nu_{S2}(\nu_{I1}-1)}\right)$$

* 5. A method according to claim 1 wherein the triplet counting rate is related to the spontaneous fission rate, the self-multiplication factor, where

$$m = \frac{1-p}{(1 - p)\upsilon_I}$$

and p = probability first neutron causes induced fission; the detection efficiency and the α,n reaction rate by the function

$$R_3 = \varepsilon^3 \cdot F_S \cdot M^3 \cdot \nu_{S3} \cdot \left(1 + 2(M-1)\frac{\nu_{S2}\nu_{I2}}{\nu_{S3}(\nu_{I1}-1)} + (M-1)(1+\alpha)\frac{\nu_{S1}\nu_{I3}}{\nu_{S3}(\nu_{I1}-1)}\left(1 + 2(M-1)\frac{\nu_{I2}^2}{\nu_{I3}(\nu_{S1}-1)}\right)\right)$$

* 6. A method according to claim 1 in which the probability distribution assigned to individual variables or counting rates is a normal distribution or a flat distribution or a triangular distribution.

7. A method according to claim 6 in which a normal distribution is used for one or more, and most preferably all, the counting rates.

*8. A method according to claim 6 in which triangular distributions are used for one or more, and most preferably all, the individual variables, such as detector efficiency, fission rate, multiplication distribution and alpha distribution.

*9. A method according to claim 6 in which a flat distribution is used for the fission rate.

*10. A method according to claim 6 in which the distribution(s) are constrained within certain applied constraints/boundaries, such that the probability distribution factor is zero beyond the constraints or such that the probability distribution factor rapidly tends to zero beyond certain values.

*11. A method according to claim 6 in which one or more of the constraints are set according to information gathered from a preceding isotopic consideration or analysis of the sample.

*12. a method according to claim 6 in which the increasing, and preferably maximisation, of the product of the probability distribution factors (pdf's) is preferably performed as an iterative process.

REMARKS

This amendment amends claim 3-6 and 8-12, to eliminate multiple dependent claims. If any fees are due in connection with the filing of this Amendment, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-0388 (Order No. UDL1P044C1)

Respectfully submitted,
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VERSION WITH MARKINGS SHOWING CHANGES MADE

CLAIMS

3. A method according to claim 1 **[or claim 2]**wherein the singlet count rate is related to the spontaneous fission rate, the self-multiplication factor, where

$$m = \frac{1-p}{(1 - p)\upsilon_I}$$

and p = probability first neturon causes induced fission; the detection efficiency and the α,n reaction rate by the function,

$$R_1 = \epsilon . F_s . M . v_{s1} . (1+\alpha)$$

4. A method according to **[any preceding claim]** **claim 1** in which the doublet counting rate is related to the spontaneous fission rate, the self-multiplication factor, where

$$m = \frac{1-p}{(1 - p)\upsilon_I}$$

and p = probability first neutron causes induced fission; the detection efficiency and the α,n reaction rate by the function

$$R_2 = \varepsilon^2 \cdot F_s \cdot M^2 \cdot \nu_{s2} \cdot \left(1 + (M-1)(1+\alpha)\frac{\nu_{s1}\nu_{i2}}{\nu_{s2}(\nu_{i1}-1)}\right)$$

5. A method according to **[any preceding claim]** **claim 1** wherein the triplet counting rate is related to the spontaneous fission rate, the self-multiplication factor, where

$$m = \frac{1-p}{(1 - p)\upsilon_I}$$

and p = probability first neutron causes induced fission; the detection efficiency and the α,n reaction rate by the function

$$R_3 = \varepsilon^3 \cdot F_s \cdot M^3 \cdot \nu_{s3} \cdot \left(1 + 2(M-1)\frac{\nu_{s2}\nu_{I2}}{\nu_{s3}(\nu_{I1}-1)} + (M-1)(1+\alpha)\frac{\nu_{s1}\nu_{I3}}{\nu_{s3}(\nu_{I1}-1)}\left(1 + 2(M-1)\frac{\nu_{I2}^2}{\nu_{I3}(\nu_{s1}-1)}\right)\right)$$

6. A method according **[to any preceding claim]** <u>**claim 1**</u> in which the probability distribution assigned to individual variables or counting rates is a normal distribution or a flat distribution or a triangular distribution.

8. A method according to claim 6 **[or claim 7]** in which triangular distributions are used for one or more, and most preferably all, the individual variables, such as detector efficiency, fission rate, multiplication distribution and alpha distribution.

9. A method according to claim 6 **[or claim 7 or claim 8]** in which a flat distribution is used for the fission rate.

10. A method according to **[any preceding claim]** <u>**claim 6**</u> in which the distribution(s) are constrained within certain applied constraints/boundaries, such that the probability distribution factor is zero beyond the constraints or such that the probability distribution factor rapidly tends to zero beyond certain values.

11. A method according to **[any of claims 6 to 10]** <u>**claim 6**</u> in which one or more of the constraints are set according to information gathered from a preceding isotopic consideration or analysis of the sample.

12. a method according to **[any preceding claim]** **claim 6** in which the increasing, and preferably maximisation, of the product of the probability distribution factors (pdf's) is preferably performed as an iterative process.